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Since the two sets differ only in the interchange of n and s, only one set is needed in view of the symmetric roles of n and s in the relation (5). We may therefore state our result as follows:

If n, s and r are integers such that $n > 0$, $s \geqq 0$, $r \geqq 0$, $ns = 3r^2$, and if $a = 3n + 6r$, $b = 3n + 12r + 3s$, the abscissas of the minimum and maximum points of the curve, $y = x(x - a)(x - b)$, are the positive integers $x_1 = 3n + 9r + 2s$ and $x_2 = n + 3r$.

The smallest unequal values of a and b are 9 and 24. In the following table are the solutions which correspond to $r = 1$ and $r = 2$.

n	1	3	1	2	3	4	6	12
s	3	1	12	6	4	3	2	1
r	1	1	2	2	2	2	2	2
a	9	15	15	18	21	24	30	48
b	24	24	63	48	45	45	48	63
x_1	18	20	45	36	35	36	40	56
x_2	4	6	7	8	9	10	12	18

The consideration of negative values of n and s is unnecessary, since it can be proved that no additional solutions of the problem are thus obtained.

Also solved by ALBERT N. NAUER, W. C. EELLS, JOSEPH B. REYNOLDS, ELMER SCHUYLER ELIJAH SWIFT, HORACE OLSON, and the PROPOSER.

MECHANICS.

292. Proposed by C. N. SCHMALL, New York City.

In a bombardment, a battleship directs its fire at a fort standing on a hill whose height is a feet above the sea level. The angle of elevation of the fort is found to be ϕ. If the initial velocity of the projectile is v, show that the fort will *not* be struck if $v < \sqrt{ag(1 + \csc \phi)}$.

SOLUTION BY H. S. UHLER, Yale University.

Let the coördinate plane contain the fort and the vertical through the ship. Also let θ denote the angle which the rifle makes with the positive (upward) direction of the axis of y. At any point of the trajectory

$$x = v \sin \theta \cdot t,$$

$$y = v \cos \theta \cdot t - \tfrac{1}{2}gt^2,$$

hence

$$gx^2 - v^2 \sin 2\theta \cdot x + 2v^2 \sin^2 \theta \cdot y = 0.$$

This parabola will pass through the fort ($x = a \cot \phi$, $y = a$) when

$$a^2 g \cot^2 \phi \cdot \cot^2 \theta - 2av^2 \cot \phi \cdot \cot \theta + a(2v^2 + ag \cot^2 \phi) = 0.$$

The roots of this quadratic in $\cot \theta$ will be complex if

$$(v^2 - ag)^2 - (ag \csc \phi)^2$$

is negative. Since this expression may be written

$$[v^2 + ag(\csc \phi - 1)] \cdot [v^2 - ag(\csc \phi + 1)],$$

it is seen at once that the fort will not be hit when

$$v < \sqrt{ag(1 + \csc \phi)}.$$

295. Proposed by B. F. FINKEL, Drury College.

A homogeneous hollow cylinder whose inner radius is half its outer radius, rolls without slipping down a plane inclined at an angle α with the horizontal. Find its acceleration.

Solution by Jos. B. Reynolds, Lehigh University.

If in a section perpendicular to the axis of the cylinder, O is the center and A the point of contact with the plane, we shall have for the moment of inertia about O,

$$I_O = \frac{\pi}{2} e\left(r^4 - \frac{r^4}{2^4}\right),$$

and for the mass

$$m = \frac{W}{g} = \pi e\left(r^2 - \frac{r^2}{2^2}\right),$$

whence

$$I_O = \frac{5}{8}\frac{W}{g}r^2$$

and therefore

$$I_A = I_O + \frac{W}{g}r^2 = \frac{13}{8}\frac{W}{g}r^2.$$

Now taking moments about A, we have $Wr \sin \alpha = I_A\ddot{\theta}$ where $\ddot{\theta}$ is the angular acceleration, or

$$Wr \sin \alpha = \frac{13}{8}\frac{W}{g}r^2\ddot{\theta},$$

whence $r\ddot{\theta} = \frac{8}{13}g \sin \alpha$, the linear acceleration of the center of the cylinder.

Also solved by H. S. Uhler.

QUESTIONS AND DISCUSSIONS.

Edited by U. G. Mitchell, University of Kansas.

REPLIES.

24. The following facts are significant:

(1) The New England Association of Mathematics Teachers has appointed a committee "to investigate the current criticisms of high school mathematics."

(2) A committee of the Council of the American Mathematical Society has under consideration the question "whether any action is desirable on the part of the Society in the matter of the movement against mathematics in the schools."

(3) At the recent meeting in Cincinnati of the National Education Association an iconoclastic discussion on the topic: "Can algebra and geometry be reorganized so as to justify their retention for high school pupils not likely to enter technical schools?" aroused approbation and applause. An outline of the remarks by one of the speakers was printed in a previous issue.

In view of these facts what should be done by those who believe in the value of mathematics as a general high school study?